

HDX-1100

Aircraft/Terrestrial High Power SD/HD Video Transmitter



User and Technical Manual

Manual Part No. 400609-1 Rev. XX - March 2011

VISLINK

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Part number **400609-1**

Printed in U.S.A.

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General Safety Information The following safety requirements, as well as local site requirements and regulations, must be observed by personnel operating and maintaining the equipment covered by this manual to ensure awareness of potential hazards. This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy. If not installed and used in accordance with the instruction manual, it may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

About this Manual This manual is intended for use by qualified operators, installers, and service personnel. Users of this manual should already be familiar with basic concepts of radio, video, and audio. For information about terms in this manual, see *Glossary of Terms and Abbreviations* (Part No. 400576-1). Pay special attention to Notes, Cautions, and Warnings.

Read **Notes** for important information to assist you in using and maintaining the equipment.

Follow **CAUTIONS** to prevent damage to the equipment.

Follow **WARNINGS** to prevent personal injury or death.

Symbols The following symbols may be on the equipment or in this manual:



WARNING: General Warning.
Risk of Danger.



WARNING: Risk of Electric Shock.



CAUTION: Electrostatic Discharge.
Possible Damage to Equipment.



Protective Earth Ground: Identifies any terminal intended for connection to an external conductor for protection against electric shock in case of a fault, or the terminal on a protective earth electrode.



Frame or Chassis Ground: Identifies the frame or chassis terminal.



Earth Ground: Identifies the earth ground terminal.



Fuse (either icon):
Identifies fuses or their location.



Waste Electrical and Electronic Equipment (WEEE): The product must not be disposed of with other waste. You must dispose of the waste equipment by handing it over to a designated collection point for recycling.

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1 About the HDX-1100

The Kamelyon™ HDX-1100 high power digital microwave transmitter is a ruggedized unit designed to support high quality video and data transmission in airborne and mobile applications, where vibration, shock, humidity, and temperature swings are everyday occurrences. The HDX-1100 is compliant with aircraft industry mounting standards, making it perfectly suited for airborne or ground based mobile platforms. Typical applications include real time video for law enforcement, public safety, fire, utility, and other agency based surveillance tasks.

The HDX-1100 includes an H.264/MPEG-4 encoder that provides standard or high definition (SD or HD) video on DVB-T/COFDM, or Vislink RangeMaster™ single carrier modulation. An MPEG-2 encoder option is available to support legacy receivers.

Video inputs may be configured for composite NTSC or PAL in standard analog formats, or digital video in SDI, HD-SDI, or ASI formats. Other inputs include two full range audio channels, and an RS-232 data channel.

The transmitter RF output is 8W in high power mode, and about 4 W in low power mode.

The HDX-1100 may be operated via the touch screen user interface (see [Section 4](#)), however it is typically controlled by an optional aircraft remote panel (RCU) (see [Section 5](#)). Initial HDX-1100 programming and presets should be configured via PC using the integrated web browser utility (see [Section 6](#)).

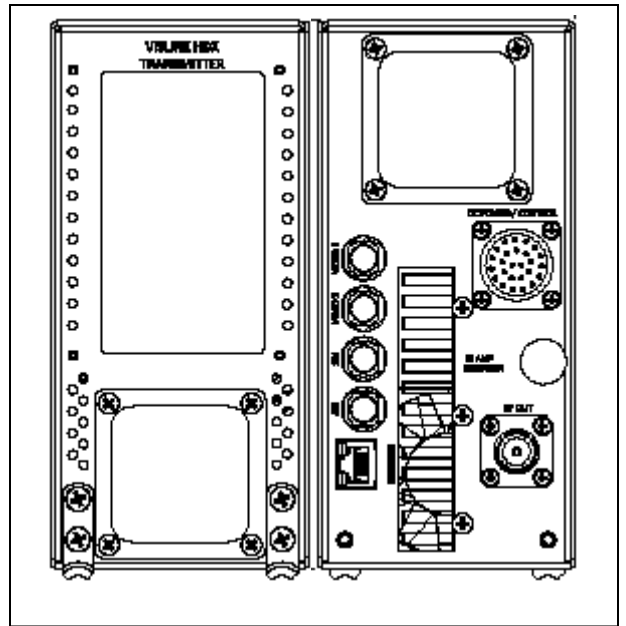
2 Operating in Safety

Guidelines for safe operation are derived from OET bulletin 65, August 1997, as recommended by the Federal Communications Commission (FCC).

WARNING

High levels of RF power are present in the unit. Exposure to RF or microwave power can cause burns and may be harmful to health. Remove power from the unit before disconnecting any RF cables and before inspecting damaged cables and/or antennas. Avoid standing in front of high gain antennas (such as a dish antenna) and never look into the open end of a waveguide or cable where RF power may be present.

The HDX-1100, operated without an antenna will not create RF energy exceeding 1.0 mW/cm^2 , the FCC limit for exposure. Connecting an antenna to the unit greatly enhances the potential for harmful exposure, and you must maintain a certain distance from the radiator. The following table shows the Maximum Permissible Exposure (MPE) safe distances from the antenna.



Antenna Gain (dBi)	0	2	3	5	11
Safe Distance (cm)	4	6	6	8	15
Safe Distance (in)	1.57	2.36	2.36	3.15	5.9

Note Hazardous RF radiation limits and recommended distances may vary by country. Observe all applicable state and federal regulations when using this transmitter.

To perform calculations to understand the safe exposure margin (MPE), use the following formula suggested by OET 65. The calculations provided are for common antennas often used in the mobile microwave environment.

Calculating MPE

$$\text{EIRP} = P * (10 ^ { (G / 10)}) = (\text{antilog of } G/10) * P$$

P = RF power delivered to the antenna in mW

G = Power gain of the antenna in the direction of interest relative to an isotropic radiator

R = distance to the center of radiation of the antenna in centimeters

S = MPE in mW/cm² (milliwatts per square centimeters)

Conversions

dBi to numeric gain = Antilog (dBi/10)

Feet to centimeters = Feet * 30.48

Centimeters to Feet = cm * .0328

4 π = 12.57

User Input

RF power delivered to the antenna = Watts

Antenna gain (referenced to isotropic antenna) = dBi

Distance from the center of radiation = Feet

Calculation steps:

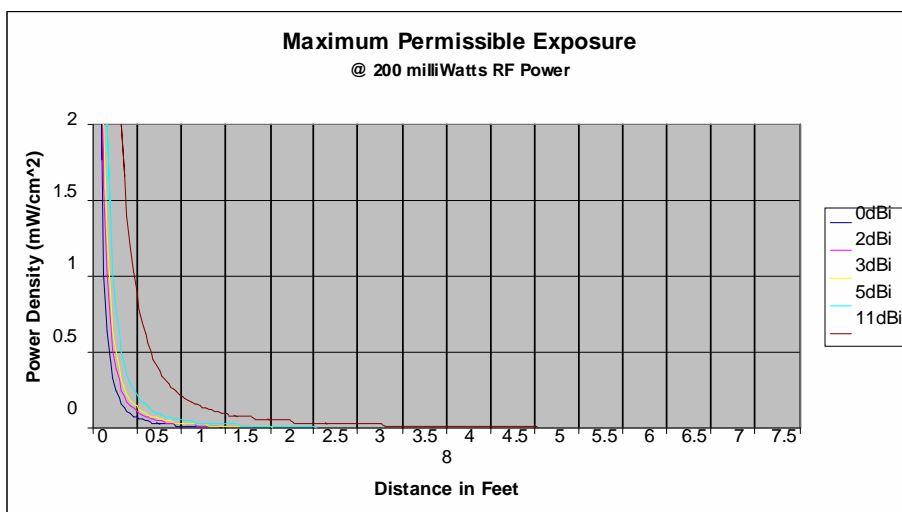
1. [P] RF power input. Watts to milliwatts = Watts * 1000
2. [G] Antenna gain dBi. Numeric gain = Antilog (dBi/10)
3. [EIRP] Multiply P * G
4. [R] Centimeters to feet = Centimeters * .0328
5. Square R
6. Multiply R² * 4π
7. [S] Divide (R² * 4π) into EIRP
S = Power Density in milliwatts per square centimeters.

Note At frequencies above 1500 MHz, S must not be greater than 1.

Reference

FCC OET Bulletin 65, August 1997 - Evaluating Compliance with FCC Guidelines for Human Exposure to Radio Frequency Electromagnetic Fields

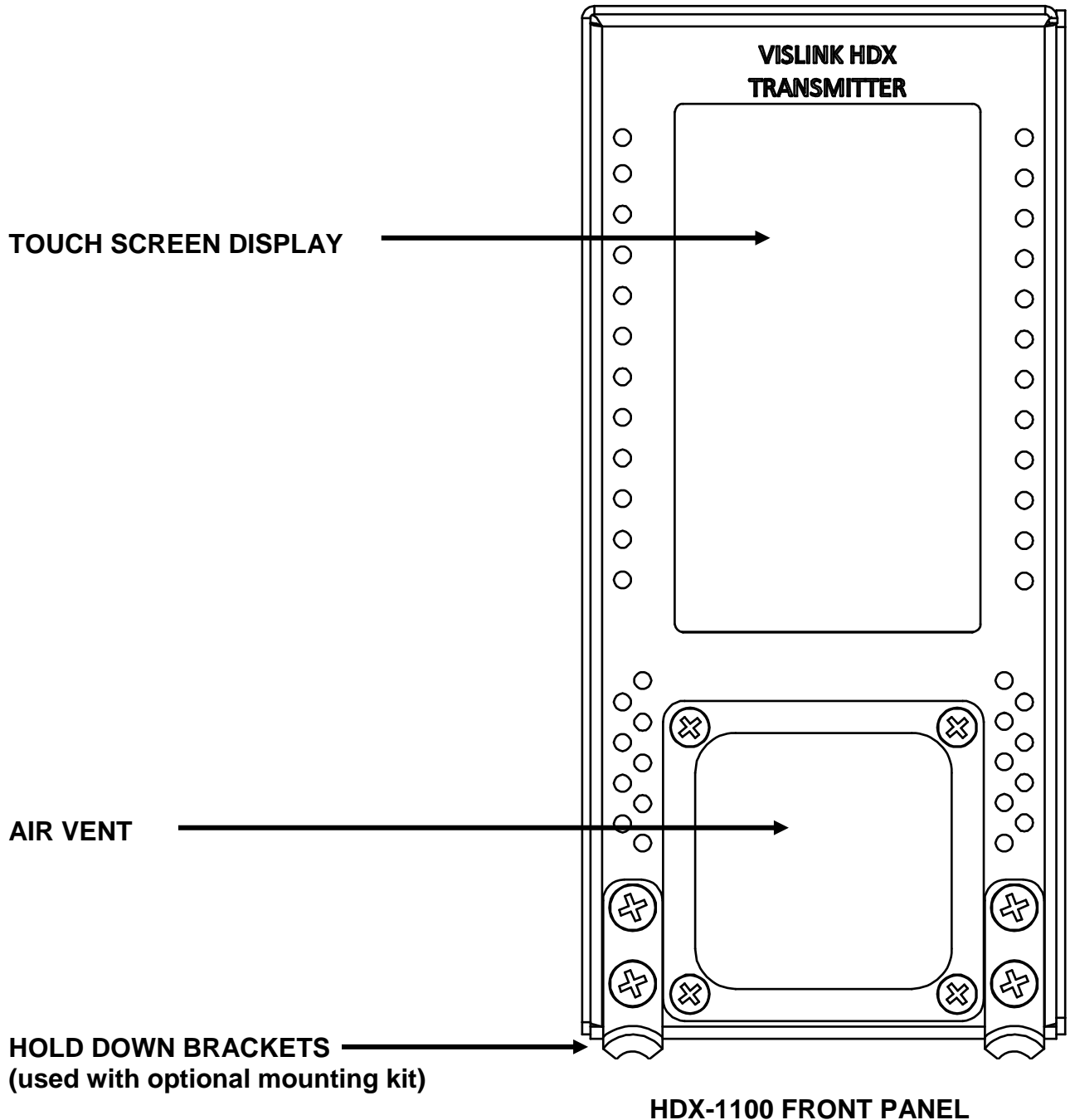
The figure to the right is a typical graph for a Vislink HDX-1100 Transmitter and shows the permissible exposure distance for various antenna gains. Graphs and data will vary, based on the actual transmitter, output power, frequency, and antenna utilized. One plot provides the permissible output of the transmitter for digital modulation, and the other plot for analog modulation.

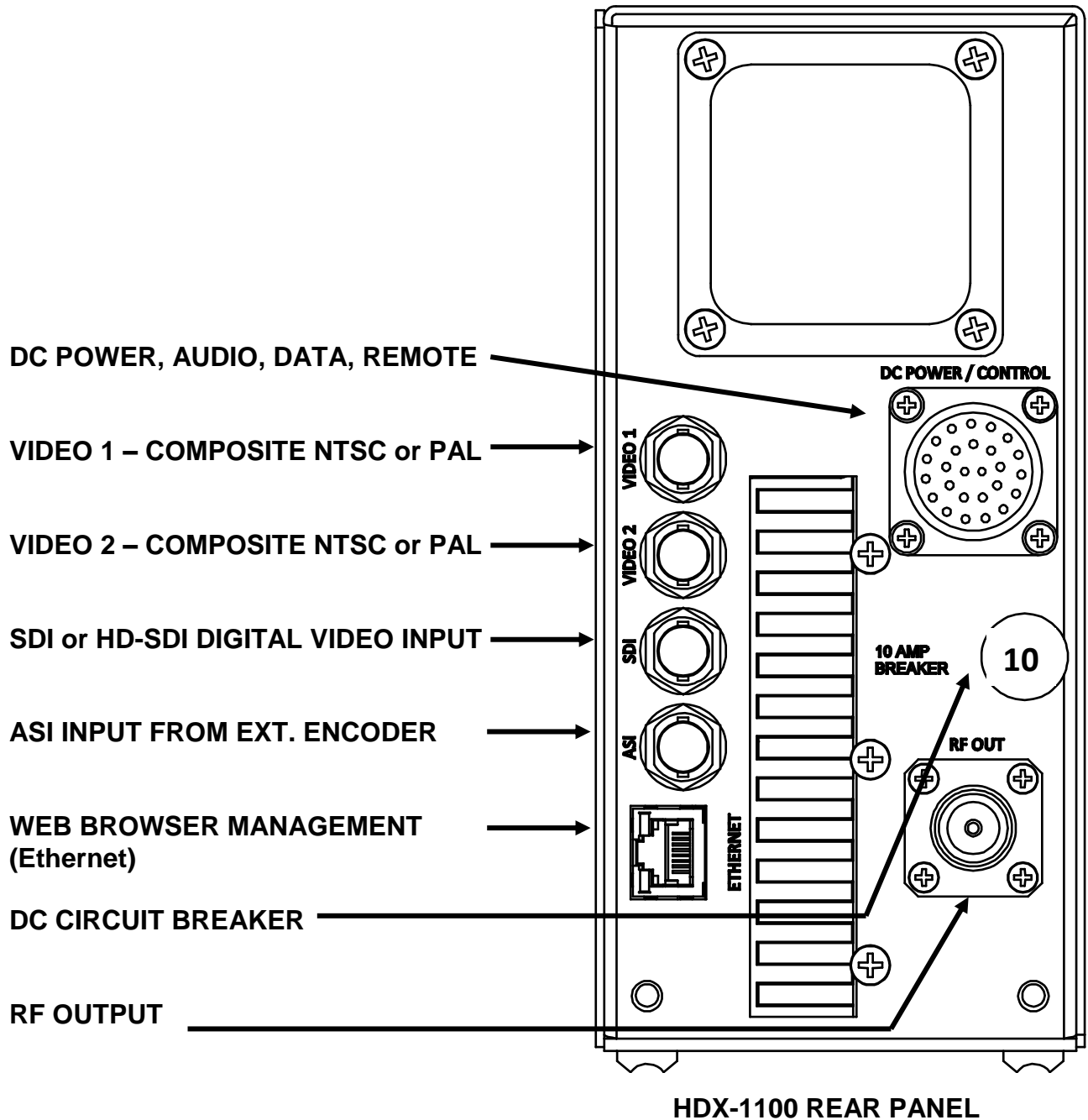


Vislink, in accordance with the requirements set forth by the FCC, provides this information as a guide to the user and assumes the users of this equipment are licensed and qualified to operate the equipment per the guidelines and recommendations contained within the product user guides and in accordance with any FCC rules that may apply.

3 Installing an HDX-1100 Transmitter

The HDX-1100 is built in an ARINC compliant 3/8 ATR housing, and was designed primarily for aircraft operation. It is also suitable for general mobile applications, including terrestrial vehicles. The transmitter and its remote control panel (RCU) have been tested and certified to be compliant with RTCA DO-160F, as recognized by the FAA and other global agencies that regulate aircraft operation and safety. **NOTE:** Aircraft installation *must* be performed by certified aircraft maintenance personnel.

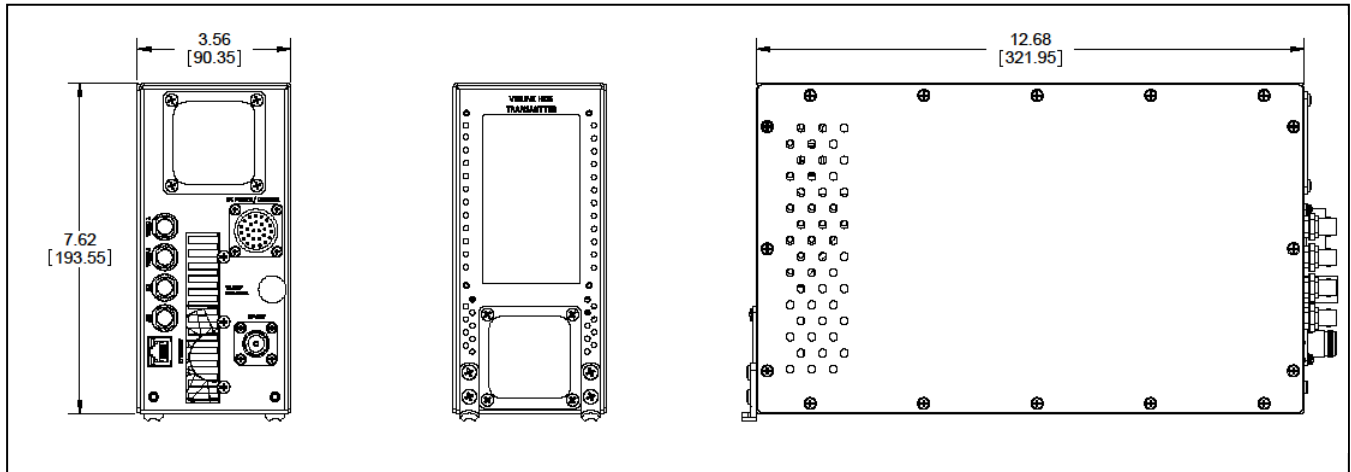




The following electrical connections must be made to place the HDX-1100 in service.

- Video Inputs and connector types:
 - Video 1: BNC female – NTSC or PAL composite
 - Video 2 - BNC female – NTSC or PAL composite (NOTE: This is the DoubleVision input, usable in MPEG-4 SD mode only)
 - SDI: BNC female - SDI or HD-SDI (configurable)
 - ASI input: BNC female – accepts signal from an external encoder
- RJ-45 jack
 - 10/100 web browser interface for set-up & maintenance
- RF Output: Type N female – 50 Ohms
- DC power in, audio, auxiliary data, and remote control, are all connected via 26 pin Bendix chassis receptacle. A mating connector is supplied with each unit, and must be wired per the drawing in section 7.3

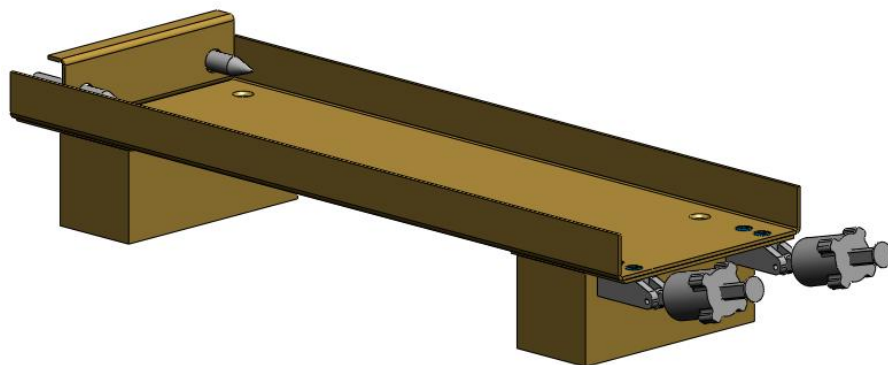
NOTE: There is a 10 AMP DC circuit breaker on front panel of HDX-1100. If the power to this breaker is fed from another circuit breaker in the aircraft, the HDX-1100 breaker should be left in the on position. To operate the breaker: push in = ON, pull out = OFF, a manual reset is required after the breaker trips.



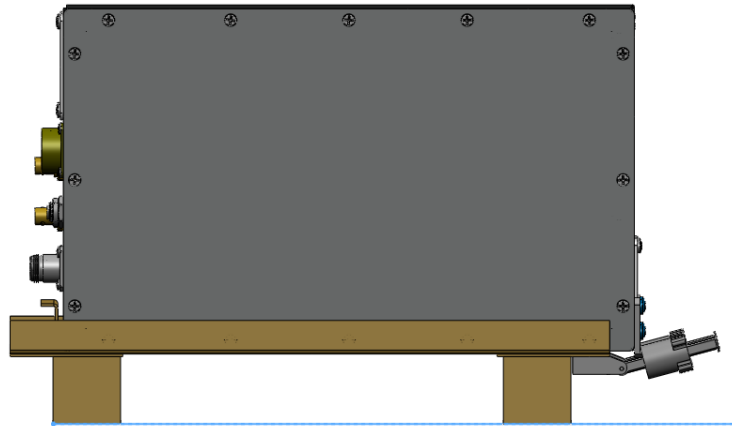
HDX-1100 MECHANICAL OUTLINE

There are two possible mounting configurations, which should provide an installer with enough flexibility to work in most situations:

- 1) For situations where the transmitter will be mounted on a flat surface, four captive nuts have been installed in the transmitter side plate.
- 2) An optional aircraft mounting kit (part # 9000372) may be ordered. The kit includes an ARINC compliant low profile tray with quick release clamps, and removable spacers.

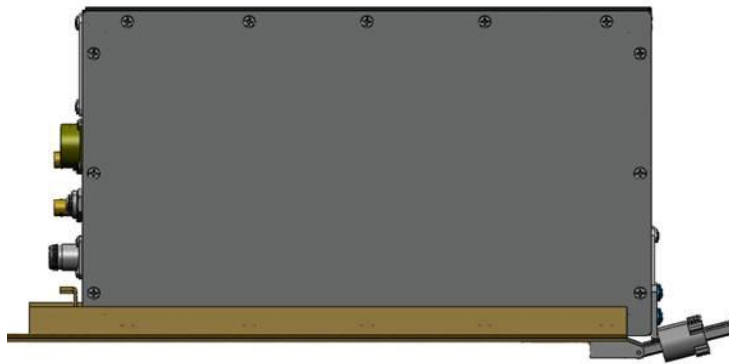


Optional 9000372 3/8 ATR mounting kit with removable spacers



HDX-1100 installed in optional 3/8 ATR mounting tray with spacers

The optional 9000372 3/8 ATR mount includes a set of spacers that may be installed if clearance is not sufficient to allow the clamps to disengage. The spacers would not be needed if the mounting plate is attached to a shelf within the airframe, as shown below.



HDX-1100 in optional 3/8 ATR tray installed on existing shelf without spacers

4 Controlling the HDX-1100 with the Touch Panel

The touch panel screen on the front of the unit lets you perform routine setup and maintenance functions and control the HDX-1100 directly as described in the following sections.

NOTE: To use the HDX-1100 front panel controls, the RCU panel must be turned off or disconnected prior to turning the HDX-1100 on.

4.1 Selecting a Preset or a Channel

The HDX-1100 recalls the most recently saved preset and channel when it is powered up. You can select from up to nine preset configurations. The last four are configured as factory defaults, but may be changed to suit your needs. Up to 15 RF channels may be configured. To select a preset, do the following:

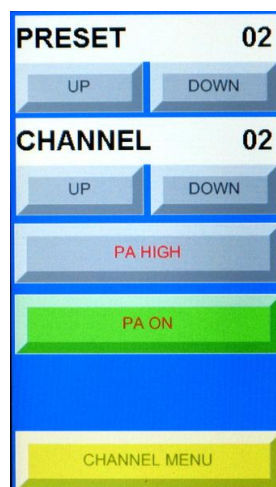
1. Press the **UP** or **DOWN** buttons below the **PRESET** bar in the display
2. The new **PRESET** selection will remain so until it is changed.
3. Press the **UP** or **DOWN** buttons below the **CHANNEL** bar in the display
4. The new **CHANNEL** selection will remain so until it is changed.

4.2 Selecting the RF Output Level

The HDX-1100 recalls the most recently saved RF output power level when it is powered up. To select between high or low power for the RF output level, do the following:

1. Press **PA HIGH/LOW** key to toggle between HIGH or LOW RF output level.
2. Press the **PA ON/OFF** button to toggle between RF on and RF off.

NOTE: When changing channels, the PA will automatically shut off to avoid interference with other users, as the frequency changes. It must be manually turned on again once the frequency change is complete (the display will change to new channel selection).



Please refer to section 8 for complete information on using the local touch screen controller

5 Setting the HDX-1100 with the Aircraft Remote Panel

You can install the Aircraft remote control unit (RCU) up to 50 feet from the HDX-1100 using a 3-wire serial interconnection and a power source. The following figure shows the RCU.



Remote Control Unit – Part Number 907621-6

When the remote panel and HDX-1100 are powered up at the same time, the remote takes priority and the HDX-1100 local touch screen will not have any menu items shown, and will appear as the in the photo below.



The following table provides detailed descriptions of the functionality of each push button and rotary switch, plus an explanation of each LED. Presets and channel numbers are both shown in LCD window displays.

Function	Name	Description
Push Buttons	RF ON/OFF	Switches the transmitter RF output between standby (STBY) and transmit (XMIT) conditions. In STBY , the RF output is zero.
	BRIGHTNESS	Sets the display brightness to high (H), low (L), or automatic (A; light sensing).
LED Displays	STBY	Indicates the HDX-1100 is in standby mode (No RF output; unit is powered but not transmitting).
	XMIT	Indicates the HDX-1100 is in transmit mode.
	DC OK	Indicates DC Power is applied to the Remote Control Panel and transmitting.
	FAULT	Indicates an error condition in the HDX-1100 transmitter.
	HI	Indicates the HDX-1100 is in high RF output mode.
	LO	Indicates the HDX-1100 is in low RF output mode.
	ENCRYPTION	Indicates the HDX-1100 is transmitting an encrypted signal
	VIDEO	Indicates the presence of a video signal at the HDX input
Rotary Switches	RF HI/LOW	Sets the HDX-1100 to high (HI) or low (LO) RF power output mode.
	PRESET	Select from 1 to 9 presets.
	CHANNEL	Select from 1 to 15 channels
LCD Display	PRESET	Displays the current preset number.
	CHANNEL	Displays the current channel number.

Use a 9-pin RS-232 null-modem cable to connect the communication path between the RCU and the HDX-1100.

A receptacle at the rear of the controller supplies DC power to the RCU. Vislink provides the 2-pin Weidmuller connector (Part # 52104-2) to connect to the power receptacle at the rear of the controller. The required power range is from +10—+50 Vdc (negative ground only).

NOTE: During initial power up, the RCU will display a C until the HDX-1100 processor completes a boot up and self check sequence; this is normal. If the C does not disappear within one to two minutes, the HDX-1100 has lost power or a communications error has occurred; check the circuit breakers, and power and serial cable connections.

To facilitate updating or servicing an HDX-1100 transmitter, we recommend that the transmitter and RCU panel are fed from different circuit breakers. In normal operation, power should be applied to the RCU first, or to both units simultaneously. To use local (front panel) control of the HDX-1100 transmitter, the RCU should be off (not powered) when the transmitter is first powered up. The RCU always has priority, and will assume control if power is applied while the transmitter is on and in local control mode. At the same time, the front panel will freeze and be non-responsive even though the RCU is functioning perfectly. To return to local control, turn both units off, and re-boot only the transmitter.

6 Configuring the internal HDX-1100 with a PC

The HDX-1100 is based on the ultra-portable Vislink HDT-1000 transmitter that has been integrated with additional components and subsystems needed to provide a high performance airborne or mobile transmission system. Presets numbers 6 through 9 of HDT-1000 module are programmed with factory defaults representing typical video settings that may be used as they are, or modified to suit your specific operating requirements. A list of factory default presets is included in Appendix 1 at the end of the manual.

WARNING: Do not attempt to modify, delete, or create new pre-sets until you have a complete understanding of the video set-up menus described below. If you have any questions in this regard, please contact Vislink customer service.

To set up the HDX-1100 transmitter with a PC, do the following:

1. Connect a LAN cable to the network connection of a router or switch and the ethernet port on the HDX-1100.
2. Open a web browser on your PC and type 192.168.1.200 into the URL address field and press Enter. The screen will change to the HDX-1100 log-in page, as shown below.



The screenshot shows a web-based login interface. At the top center is the MRC logo, which consists of the letters 'MRC' in a blue serif font inside a grey circular arc. Below the logo is the text 'VISLINK GROUP' in a smaller, grey, sans-serif font. Underneath this is a small rectangular button labeled 'Help'. Below the 'Help' button are two input fields: the first is labeled 'User Name:' and the second is labeled 'Password:'. At the bottom of the form is a rectangular button labeled 'Log In'.

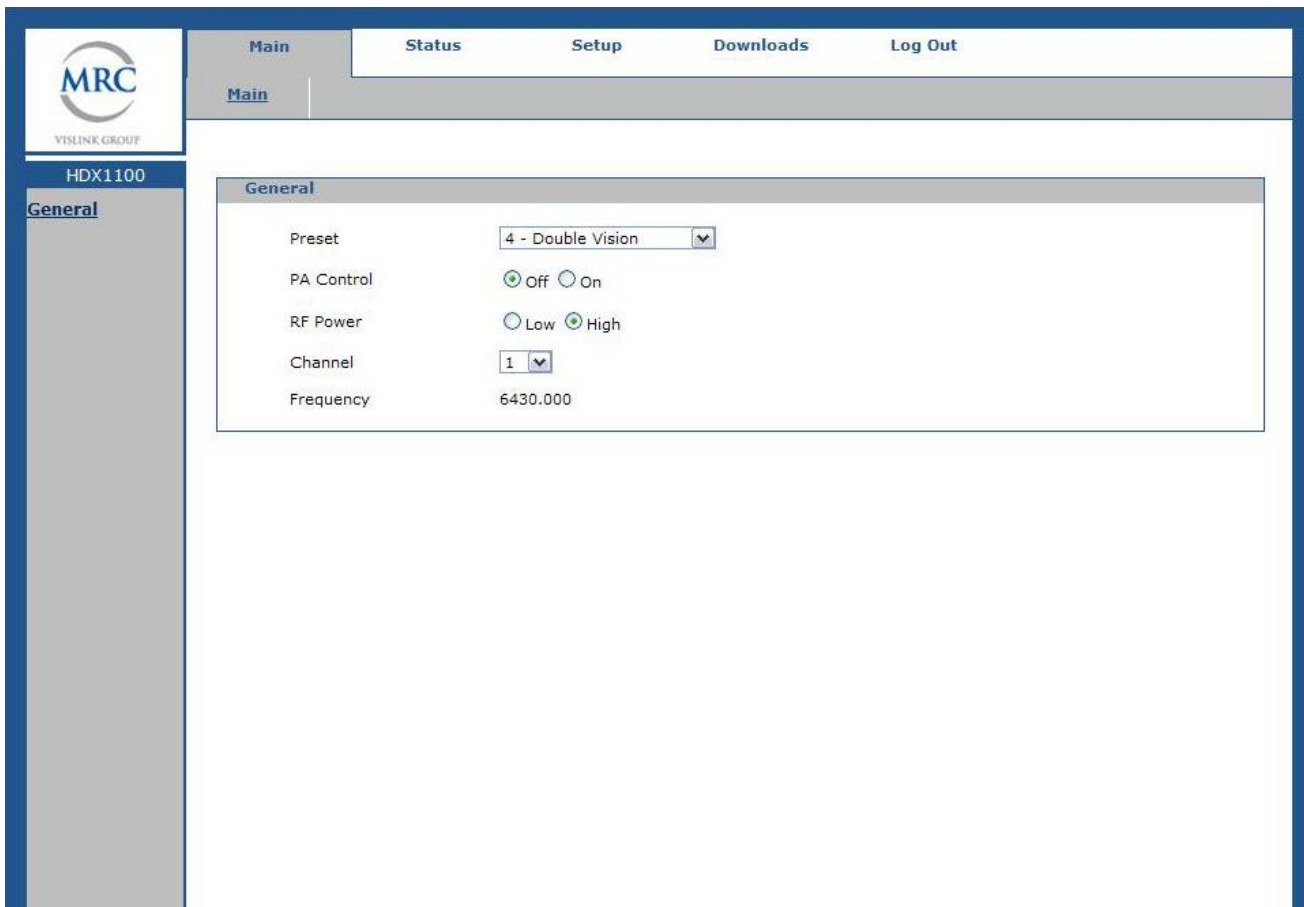
The factory defaults are: User Name = root
Password = root

NOTE: The factory default user name and password should be changed immediately to

prevent unauthorized access. The new user name and password should be recorded and stored in a safe place.

6.1 MAIN SCREEN:

After the login procedure is complete, the browser will open to the MAIN SCREEN, providing a view of operating conditions for the currently active pre-set. A drop down menu on the pre-set line allows you to change to any available pre-set and review the parameters for each pre-set. Changes to pre-sets CANNOT be made from this screen of the browser. The information on the MAIN SCREEN of the browser is the same as the information on the main screen of HDX-1100 touch panel.



WEB BROWSER - MAIN SCREEN

STATUS SCREEN:

The **STATUS** screen allows you to review the following:

- Radio serial number, software revision, and network settings
- MPEG-2 encoder setup
- H.264/ MPEG-4 encoder setup

To view, click on “Status” in the bar at the top of the screen, and a drop down section will appear. Select which of the status items you wish to review and all of the viewable parameters will be summarized in a column on the left side of the screen.

In the screen shot below, “Radio” has been selected from the drop down menu bar on the top, and “S/W revision” has been selected from the menu choices on the left side of the screen. The display shows all of the software revisions currently installed in the HDX-1100.

The screenshot displays the HDX-1100 web interface. At the top, there is a navigation bar with tabs for 'Main', 'Status', 'Setup', 'Downloads', and 'Log Out'. Below this, a secondary bar shows 'Radio', 'MPEG2', and 'MPEG4'. The left sidebar contains the MRC logo, 'VISLINK GROUP', 'HDX1100', and a menu with 'SystemInfo', 'NetworkInfo', and 'S/WRevision'. The main content area is titled 'Software Revisions' and contains a table with the following data:

Software Revisions	
System Software Rev	1.08
MPEG2 Software Version	1.6
MPEG4 Software Version	1.9.350.B3

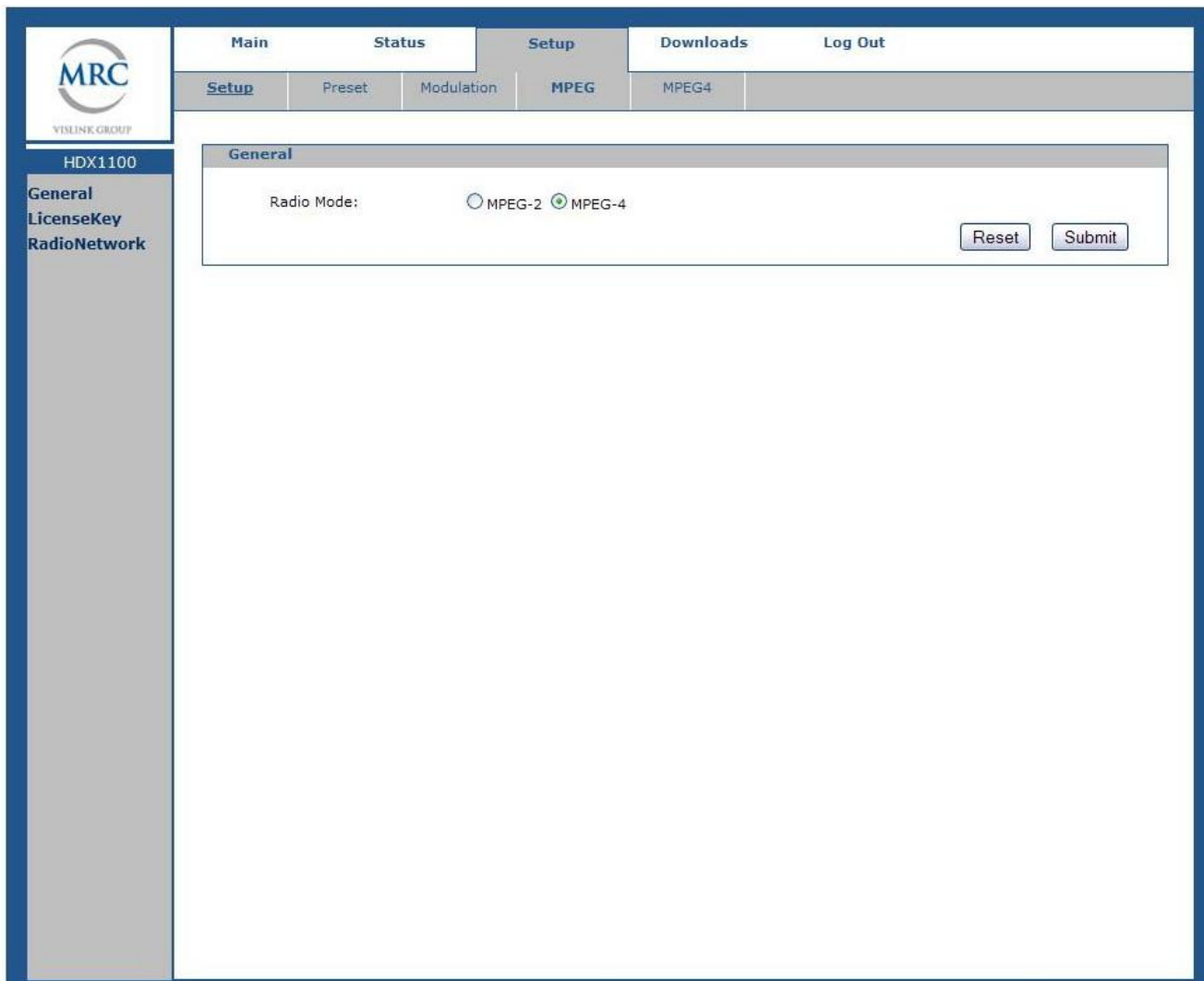
MAIN SCREEN – STATUS TAB - SOFTWARE REVISION DISPLAY

6.2 SETUP SCREEN:

The **SETUP** screen is the only screen in the web browser utility that allows the HDX-1100 to be programmed initially, or allows changes to be made in

existing programming. The **SETUP** screen allows qualified maintenance personnel to program new presets and edit existing presets.

Initial Setup: Click on the word “Setup” in menu bar at the top of the display. In the main area of the display, the **General Setup** screen will open as shown below.



GENERAL SETUP SCREEN

In the example above, the MPEG-4/ H.264 encoding mode is active for the current preset. It may be changed to MPEG 2 by clicking on the MPEG-2 dot, and then clicking the submit button.

NOTE: If your HDX-1100 is not equipped with the MPEG-2 option, this choice will not be clickable.

IMPORTANT: When **RESET** and **SUBMIT** buttons are present in a setup screen, the **SUBMIT** button is used to enter new data into the program while the **RESET** button will cancel any programming action currently entered, but not yet submitted. Clicking the **RESET** will return you to the previous screen.

To view the HDX-1100 serial number, or re-enter the license key, select **License Key** in the column on the left side of the display, and the screen below will appear:

Main	Status	Setup	Downloads	Log Out	
Setup	Preset	Modulation	MPEG	MPEG4	ChannelPlan

MPEG4 License Key	
Serial Number:	7000000014699B4E
Licence Key:	<input type="text"/>

MPEG2 License Key	
Serial Number:	254E475E
Licence Key:	<input type="text"/>

License Key Screen

The **Serial Numbers** are entered at the factory, and are always visible in the space provided. The **License Keys** are never visible, except when they are being entered at the factory, or reentered in the field after a repair has been made. In both cases the **License Key** numbers will disappear as soon as the submit button is pushed. The **License Key** number is provided to the

customer along with the factory data.

6.3 Radio Network Screen:

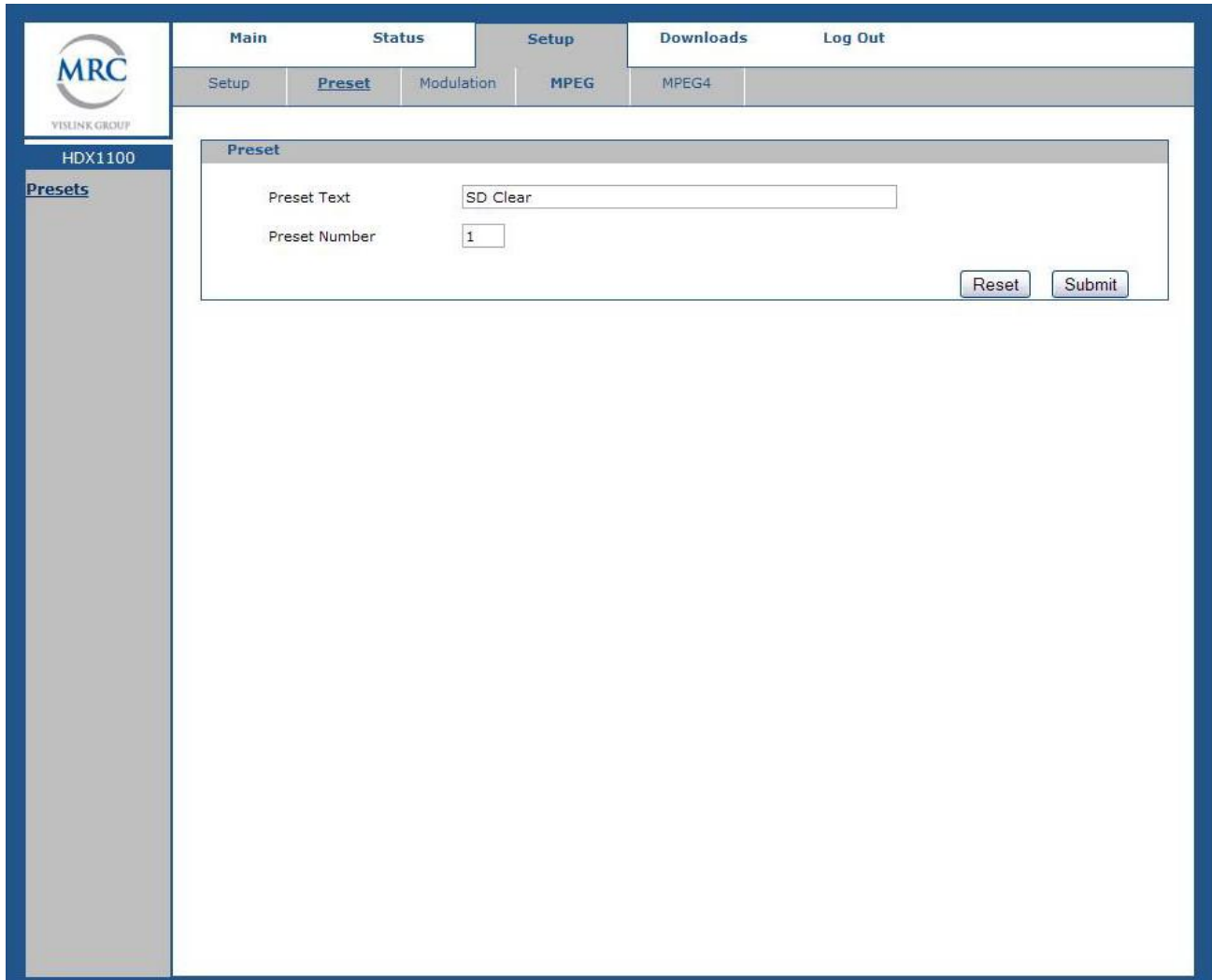
The values initially found in the **IP address**, **Subnet**, and **Gateway** dialog boxes of the radio network screen are factory defaults. These should be changed to match your specific network requirements. Changes are accomplished by entering the new values in the dialog boxes then clicking on the submit button. If an error is made during the entry process, simply click the reset button to return to the previous screen, from which the process can be restarted.

The screenshot shows a web-based interface for configuring a radio network. The top navigation bar includes 'Main', 'Status', 'Setup', 'Downloads', and 'Log Out'. The 'Setup' menu is expanded to show 'Setup', 'Preset', 'Modulation', 'MPEG', and 'MPEG4'. The 'Radio Network' section contains three input fields: 'IP Address' (192.168.1.150), 'Subnet' (255.255.255.0), and 'Gateway' (192.168.1.1). 'Reset' and 'Submit' buttons are located at the bottom right of the form. The left sidebar shows the 'MRC' logo and 'VISLINK GROUP' with a menu for 'HDX1100' containing 'General', 'LicenseKey', and 'RadioNetwork'.

SETUP - RADIO NETWORK SCREEN

6.4 CONFIGURING PRESETS

For maximum flexibility, a complete set of parameters must be defined for each preset that is programmed into the HDX-1100. To begin the process, select **Preset** from the drop-down menu in the bar at the top of the display, and the screen shown below will appear.



The screenshot displays the HDX-1100 web interface. At the top left is the MRC VISLINK GROUP logo. The main navigation bar includes 'Main', 'Status', 'Setup', 'Downloads', and 'Log Out'. Below this, a secondary bar shows 'Setup', 'Preset' (highlighted), 'Modulation', 'MPEG', and 'MPEG4'. The left sidebar contains 'HDX1100' and 'Presets'. The main content area is titled 'Preset' and contains two input fields: 'Preset Text' with the value 'SD Clear' and 'Preset Number' with the value '1'. 'Reset' and 'Submit' buttons are located at the bottom right of the form.

PRESET SCREEN

The **Preset Text** box accepts user input to identify each preset. Text is entered by the user for each preset, and saved with the **Submit** button.

To initiate programming or make a change, click on **Preset Number** and choose the preset you wish to program or change from the drop down menu. Enter the new text in the **Preset Text** dialog box, and click the

Submit button when you are satisfied with the result. Next, click on the **Modulation** button in the menu bar at the top of the screen.

The screenshot shows the MRC (MPEG Reference Client) interface. The top navigation bar includes 'Main', 'Status', 'Setup', 'Downloads', and 'Log Out'. The 'Setup' section is active, with sub-menus for 'Setup', 'Preset', 'Modulation', 'MPEG', and 'MPEG4'. The 'Modulation' sub-menu is selected, displaying the following settings:

- Constellation: QPSK 16-QAM 64-QAM
- Guard Interval: 1/4 1/8 1/16 1/32
- FEC: 1/2 2/3 3/4 5/6 7/8
- RF B/W: 6 MHz 7 MHz 8 MHz

At the bottom right of the Modulation setup area, there are 'Reset' and 'Submit' buttons.

MODULATION SETUP SCREEN

Modulation setup determines the bit rate that the transmitter can send to the receiving station for each preset. Lower bit rates will work better in situations where extreme fades, interference, or multipath are present. Higher bit rates are not as robust; however, they may be required for highest quality HD transmission.

The maximum available bit rate is directly related to the modulation type and the channel bandwidth. The following tables provide a complete summary of modulation settings for both 6 and 8 MHz DVB-T bandwidths as a function of bit rate. In order to comply with FCC emission standards, a 6 MHz DVB-T bandwidth is the maximum allowed in an 8 MHz wide RF channel, while an 8 MHz DVB-T bandwidth can be used in a 10 MHz or wider RF channel. A 10 MHz DVB-T bandwidth can support a total bit rate 33% higher than an 8 MHz channel, if all other factors are equal.

Available bitrates (Mbit/s) for a DVB-T system in 6 MHz channels					
Modulation	Coding rate	Guard interval			
		1/4	1/8	1/16	1/32
QPSK	1/2	3.732	4.147	4.391	4.524
	2/3	4.976	5.529	5.855	6.032
	3/4	5.599	6.221	6.587	6.786
	5/6	6.221	6.912	7.318	7.540
	7/8	6.532	7.257	7.684	7.917
16-QAM	1/2	7.465	8.294	8.782	9.048
	2/3	9.932	11.059	11.709	12.064
	3/4	11.197	12.441	13.173	13.572
	5/6	12.441	13.824	14.637	15.080
	7/8	13.063	14.515	15.369	15.834
64-QAM	1/2	11.197	12.441	13.173	13.572
	2/3	14.929	16.588	17.564	18.096
	3/4	16.796	18.662	19.760	20.358
	5/6	18.662	20.735	21.955	22.620
	7/8	19.595	21.772	23.053	23.751

Modulation setting versus bitrate for a 6 MHz DVB-T bandwidth

IMPORTANT: The 6 MHz DVB-T bandwidth setting is the maximum that may be used in an 8 MHz wide RF channel.

Available bitrates (Mbit/s) for a DVB-T system in 8 MHz channels					
Modulation	Coding rate	Guard interval			
		1/4	1/8	1/16	1/32
QPSK	1/2	4.976	5.529	5.855	6.032
	2/3	6.635	7.373	7.806	8.043
	3/4	7.465	8.294	8.782	9.048
	5/6	8.294	9.216	9.758	10.053
	7/8	8.709	9.676	10.246	10.556
16-QAM	1/2	9.953	11.059	11.709	12.064
	2/3	13.271	14.745	15.612	16.086
	3/4	14.929	16.588	17.564	18.096
	5/6	16.588	18.431	19.516	20.107
	7/8	17.418	19.353	20.491	21.112
64-QAM	1/2	14.929	16.588	17.564	18.096
	2/3	19.906	22.118	23.419	24.128
	3/4	22.394	24.882	26.346	27.144
	5/6	24.882	27.647	29.273	30.16
	7/8	26.126	29.029	30.737	31.668

Modulation setting versus bitrate for an 8 MHz DVB-T bandwidth

NOTE: External encoder required for bit rates in yellow highlight.

Other factors that impact the total available bit rate are the code rate and the guard interval settings.

Coding Rate Setting: This setting determines the amount of forward error correction used to reduce video data loss under adverse conditions. If the code rate is set to $\frac{1}{2}$, this means that half of the available data rate is being used for error correction, while the rest is available for video. A code rate of $\frac{1}{2}$ uses the most bandwidth for error correction, but provides the highest degree of protection against video breakup.

Guard Interval: The primary purpose of the guard interval is to provide resistance to multipath and co-channel interference. Longer guard intervals are used in dense metro areas, where high levels of multipath are expected. A guard interval of $\frac{1}{4}$ is the longest, while $\frac{1}{32}$ is the shortest.

NOTE: When programming an HDX-1100, a good rule of thumb is to program several presets with varying amounts of error correction to be able to quickly switch quickly from a very robust, low data rate setting, to a less robust but higher-speed setting.

6.5 VIDEO AND AUDIO INPUT SETUP

The video and audio inputs must be configured for each preset. To initiate this procedure, click on **MPEG-2** or **MPEG-4** in the bar at the top of the screen, and then click on **Video** on the left side of the screen. Two dialogue boxes will appear: **Video In**, and, **Encryption**. See next graphic for details.

IMPORTANT: When equipped with the MPEG-2 encoding option, HDX-1100 presets may be programmed all in MPEG-2 mode, all in H.264/MPEG-4 mode, or as a mix of the two. For example, the first five presets may be programmed for MPEG-2 encoding, while the remaining four are programmed for H.264/MPEG-4 encoding.

Video Settings: Click on **Video In** and select the desired parameters from the drop down table. Available parameters include the input configuration, such as composite or SDI, as well as video resolution. MPEG-2 settings differ from MPEG-4 settings, and require additional choices to be made, including

NOTE: **Input A** is the normal video input and must always be set up. When using the

DoubleVision option, **Input B** must also be set up.

The screenshot shows the MRC HDX1100 web interface. The top navigation bar includes 'Main', 'Status', 'Setup', 'Downloads', and 'Log Out'. The 'Setup' section is active, with sub-tabs for 'Setup', 'Preset', 'Modulation', 'MPEG', 'MPEG4', and 'ChannelPlan'. The 'MPEG4' sub-tab is selected. The left sidebar shows 'Video' and 'Audio' sections. The main content area is divided into 'Video In' and 'Encryption' sections. In the 'Video In' section, 'Input A' is set to 'Composite', 'Input B' is 'Disabled', and 'Resolution' is '480i(NTSC)'. The 'Encryption' section has 'Encryption Mode' set to '480i(NTSC)', 'Encryption Key' and 'Encryption-256 Key' fields are empty, and 'Encryption-128 Key' is partially visible. There are 'Reset' and 'Submit' buttons at the bottom right.

Video and Encryption Mode set-up Screen

If encryption is to be used, select **Encryption** from the **Video** drop down menu, and configure the encryption mode and key as required for encrypted preset, and click **Submit**.

Note: For 128-bit encryption, enter 32 hexadecimal characters.

For 256-bit encryption, enter 64 hexadecimal characters.

6.6 CHANNEL SETUP

Normally, a customer specified channel plan is set up at the factory when the HDX-1100 is built, however, additional channels may be added at any time, or existing channels may be redefined if necessary. These changes can only be made by qualified technical service personnel.

Channel	Frequency (MHz)	Value
Channel 1	6430.000MHz	6430.000
Channel 2	6438.000MHz	6438.000
Channel 3	6446.000MHz	6446.000
Channel 4	6455.000MHz	6455.000
Channel 5	6463.000MHz	6463.000
Channel 6	6471.000MHz	6471.000
Channel 7	6480.000MHz	6480.000
Channel 8	6488.000MHz	6488.000
Channel 9	6496.000MHz	6496.000
Channel 10	6505.000MHz	6505.000
Channel 11	6513.000MHz	6513.000
Channel 12	6521.000MHz	6521.000
Channel 13	6437.500MHz	6437.500
Channel 14	6462.500MHz	6462.500
Channel 15	6487.500MHz	6487.500

CHANNEL PLAN SETUP SCREEN

For each channel to be added or set up, enter the correct frequency information in the dialog box on the right-hand side of the screen corresponding to the desired channel number. Once you have completed and checked the frequency entry, click the submit button and the new frequencies will appear in the dialog boxes on the left side of the screen.

6.7 Recalling a Preset Configuration from a PC

1. Select **Preset** from the **Radio** drop down menu.
2. Select the preset number and click Load. The relevant parameters will be populated under Video and Radio.
3. Select “save” to change to the active preset.

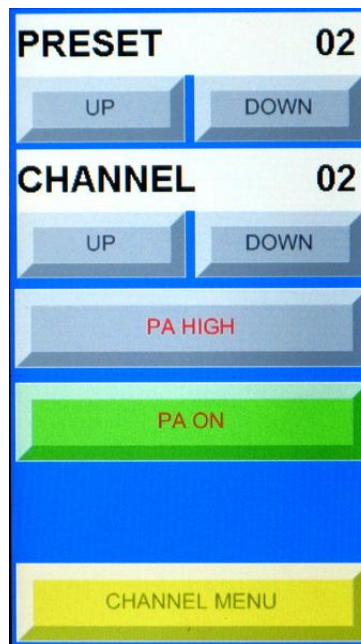
Note The Encryption code will not display.

Click **Logout** to finish setting up the HDX-1100

Once this procedure has been completed, the pre-sets that were established may be recalled using the aircraft remote panel.

NOTE: The HDX-1100 transmit frequency settings may be configured via the web browser, or from the HDX-1100 front panel. See section 7 for details.

7 HDX-1100 Program & Control Screens



Main Screen

Preset : Displays current pre-set selection

Up – Down: Steps through pre-sets (1-9)

Channel: Displays current channel selection

Up – Down: Steps through channels (1 -15)

PA HIGH/ LOW: toggles between high & low power

PA ON/OFF: Switches PA ON or OFF

Channel Menu: Will go to Channel Menu screen

MAIN SCREEN OPERATION

When operating the HDX-1100 transmitter in local mode (touch screen active), the main screen will be displayed first. The current preset and channel selections are controlled by touching the up and down buttons below the respective sections of the display. For example, to move to a lower channel, touch the down arrow below the CHANNEL bar in the main screen.

High or low power may be selected by touching the PA HIGH/ LOW button, which will toggle the setting between HIGH and LOW each time the button is touched. The label will change to confirm that the new selection has been completed.

PA ON or PA OFF settings are selected by touching the PA ON/OFF button, which will toggle the setting between ON and OFF each time the button is touched. The label will change to confirm that the new selection has been completed.

NOTE: When changing channels, the PA will automatically shut off to avoid interference with other users, as the frequency changes. It must be manually turned on again once the frequency change is complete (the display will change to new channel selection).



Channel Menu

Channel: Displays current channel selection

MHz: Frequency of current channel

Left/Right Arrows : move cursor left or right

Up – Down: Changes the selected frequency digit

Set Frequency: Touch this button to set or change current channel

Back: Will save setting and return to Main screen

7.1 SETTING OR MODIFYING CHANNEL FREQUENCY

To initiate or modify a channel frequency, first select the channel assignment to be modified on the main screen, then touch the CHANNEL MENU button on the main screen; the display will

change to the screen shown above.

To access the channel assignment menu, first touch the SET FREQUENCY button on the screen. You will notice that one of the digits in the FREQUENCY bar will now have a black, blinking cursor.

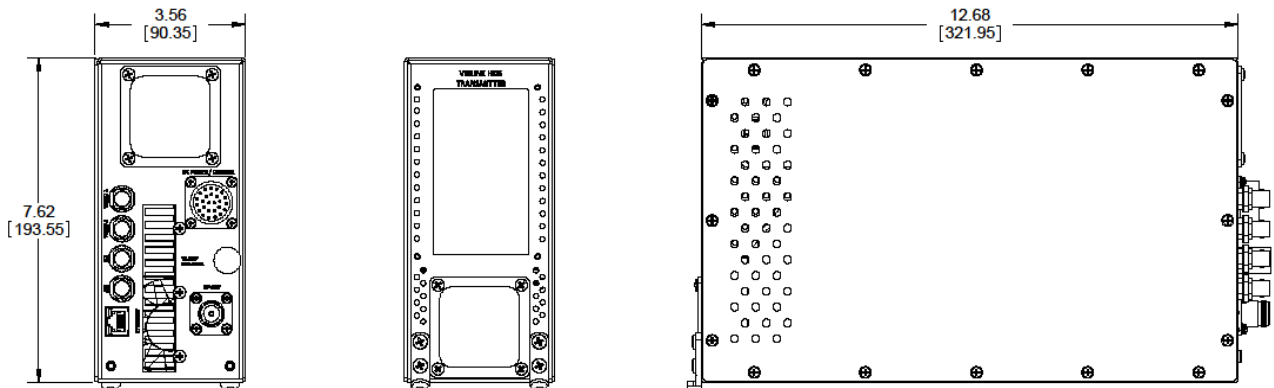
Using the left and right arrows below the FREQUENCY bar, navigate the blinking cursor to the digit that will be changed first. In the screen shot above for example, the current frequency of channel 2 is 6438.000 MHz, however you want to change this to 6455.000.

- 1) Touch the set frequency button
- 2) Using the arrows, move the cursor to the 3 (third digit)
- 3) Touch the UP button once to change the 3 to a 4
- 4) Move the cursor to the 8 (fourth digit)
- 5) Touch the DOWN button three times to change the 8 to a 5
- 6) Touch the BACK button to save the new frequency

If you wish to add or change another channel, go to that channel while in the main screen, then touch the channel menu button and repeat the process above. This process must be repeated each time a channel is added or changed.

8 HDX-1100 Specifications

The following figure shows the front, back, top, and side views of the HDX-1100.



- **Dimensions:** 3.65 x 7.62 x 12.68 inches (ARINC ATR 3/8 compliant size)
- **Weight:** 8 pounds (3.6 kg)
- **Operating temperature:** $-10\text{ }^{\circ}\text{C}$ to $+55\text{ }^{\circ}\text{C}$; **storage temperature:** $-40\text{ }^{\circ}\text{C}$ to $+75\text{ }^{\circ}\text{C}$
- **Humidity:** up to 95% relative and non-condensing
- **Altitude:** up to 20,000 feet (6,000 m)

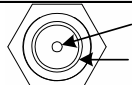
8.1 Band and Frequency Options

You can order the HDX-1100 for the following frequency bands (others on special order):

Model	Band	Frequency	Typical Power Consumption	Frequency Stability	Frequency Step Size
HDX-1100L	L	1.7—1.9 GHz	90W	2.5 ppm	250 Khz
HDX-1100S	S	2.0—2.5 GHz	90W	2.5 ppm	250 Khz
HDX-1100C1	C1	3.1—3.5 GHz	90W	2.5 ppm	250 Khz
HDX-1100C2	C2	4.4—5.0 GHz	90W	2.5 ppm	250 Khz
HDX-1100C3	C3	6.4— 6.5 GHz	90W	2.5 ppm	250 Khz
HDX-1100X	X	8.1—8.5 GHz	90W	2.5 ppm	250 Khz

8.2 Video Input Connectors

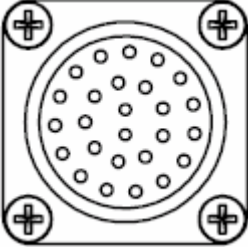
SDI, HD-SDI and analog composite video inputs connect via BNC's on the rear panel.

BNC Connector	Pin	Description
 <p>Signal Ground</p>	Pin	Signal
	Ring	Ground

8.3 DC POWER and CONTROL Connector

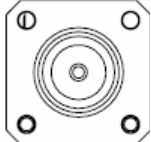
DC voltage for the HDX-1100 is +10 Vdc to +32 Vdc with reverse voltage protection. Ensure that the power being supplied matches the power required by the equipment.

I/O connector 26-Pin Male D connector pin-outs are shown in the following table:

Power Connector	Pin	Description	Pin	Description
	A	+DC Voltage in	P	Serial CTRL Output
	B	+DC Voltage in	R	N/C
	C	Audio 1 + input	S	N/C
	D	Audio 1 - input	T	Reserved
	E	Audio 1 Shield/GND	U	Reserved
	F	Audio 2 Shield/GND	V	Reserved
	G	Audio 2 + input	W	Ethernet RX +
	H	Audio 2 - input	X	Ethernet RX -
	J	Wayside Data Input	Y	Ethernet TX +
	K	Wayside Data GND	Z	Ethernet TX -
	L	N/C	a	Reserved
	M	Serial CTRL Input	b	- DC Voltage in
	N	Serial CTRL GND	c	- DC Voltage in

8.4 RF OUT Connector

The RF Output is a Type N female connector with a 50 Ω characteristic impedance.

N Connector	Pin	Description
	Center	RF Signal - 50 Ω
	Ring	Ground

8.5 Modulation

- DVB-T (standard feature)
 - COFDM 2K CARRIER MODE PER ETSI EN 300 744
 - COFDM QPSK
 - COFDM 16QAM
 - COFDM 64QAM
- RangeMaster™ (Optional feature)
 - Narrow Band SCM, programmable, 1–10 MHz bandwidth, QPSK only

8.6 Encryption

Only one type of encryption can be installed in each transmitter, and it must be done at the factory. The choices are limited to:

- RCBC (Reverse Chain Block Ciphering)
- AES 128-bit
- AES 256-bit

Note ASI input streams are not encrypted

8.7 RF Output Power

- *High Power Mode*: Enables PA and supplies output power of 8 W (+ 39 dBm)
NOTE: An optional 10W (+40 dBm) amplifier is also available
- *Low Power Mode*: Enables PA and supplies reduced output power of 3 to 6 dB
- Impedance: 50 Ohms: 17 dB return loss, typical
- Protection: Transmitters will not be damaged by an infinite VSWR at any phase angle at the RF output connector for an indefinite time.
NOTE: An optional 10W (+40 dBm) amplifier is also available

8.8 Audio Characteristics

- Two audio inputs are to be supported which can be both line, both microphone, or one of each.

8.9 Video Input Format

- ASI: 188 byte, EN50083-9
- HD-SDI: SMPTE 292M
 - 1920x1080i @ 25, 29.97, or 30 frames per second
- SDI: SMPTE 259M
 - 720 x 480i @ 25/30fps
 - 720 x 576i @ 25/30fps
- Analog Composite: 1 V p/p TIA/EIA RS170
 - 720 x 480i NTSC 525
 - 720 x 576i PAL 625
- Wayside Data Rate: up to 115.2 kbps
- Video input impedance: 75 Ohm unbalanced

8.10 Encoding: SD, HD in H.264 mode

Supports the following MPEG requirements:

- High Definition (HD)
- Standard Definition (SD)

- Compression Type: AVC / H.264 / MPEG-4 Part 10
- Compression Standard: ISO/IEC 14496-10
- Min Motion Est. Range: ± 192 Horiz., ± 128 Vert.
- GOP Structure: I-only and IP; GOP Length: 1 to 100, Selectable
- Profiles supported: BP@L4 with Interlaced support or higher, HiP@4.1
- Video bit rates: ≤ 20 Mbps
- System Latency, end-to-end delay exclusive of propagation delay: ≤ 4 frames
- Transport Stream: AVC/H.264/MPEG-4 encapsulated into MPEG Transport Stream (ITU-T Rec. H.222.0 Amd 3)
- Video Inputs: HD-SDI (SMPTE 250M) video input and 480p shall be mapped onto SMPTE 292M as defined in SMPTE 349M.

9 Local System Access and Management Interfaces

The front panel of the HDX-1100 includes an LCD touch screen that allows radio operating parameters to be initially configured and later modified by maintenance personnel. The touch screen provides the ability to recall and review and/or change the frequency of channel presets, turn the power amplifier on and on, switch between high power and low power modes, and gives visual feedback to maintenance personnel for each of the described actions. Future software updates will provide additional set-up capability, including the ability to set modulation constellation, guard interval, and Forward Error Correction, and will support saving any changes to a selected or new preset.

NOTE: The HDX-1100 touch screen will allow local control only when the remote control (RCU) panel is disconnected, or powered down. If the RCU panel is turned on or connected while the HDX-1100 is powered on, the RCU will take priority for as long as the units are powered on. The local touch screen will continue to display the last setting, but will not longer control transmission parameters.

To regain local control, the HDX-1100 must be powered down, and the RCU must be turned off or disconnected, before powering up the HDX-1100 again.

Once the boot-up sequence is completed in local control mode, the main screen will be shown, as illustrated in 8.1 below.

10 Getting Support for Your HDX-1100

You can contact the Vislink Technical Support staff as follows:

24- Hour Worldwide Technical Support

Americas

USSupport@vislink.com

888.777.9221 (US & Canada)

+1 978.671.5929 (outside of US & Canada)

United Kingdom

UKSupport@vislink.com

+44 (0) 1442 431 410

Asia Pacific

APACsupport@vislink.com

+65 8189 3040

When you contact Technical Support, include the following information:

- Model number and serial number of the unit (located on a label on the bottom of each unit).
- Approximate purchase date.

There are no supported field repairs to the HDX-1100. Return the unit for factory repair.

CAUTION

If you attempt field repair, you risk damaging your equipment. If your equipment is under warranty, you may also affect your warranty coverage. The HDX-1100 requires specialized test equipment and software to calibrate operating characteristics after repair.

11.0 Glossary of Terms

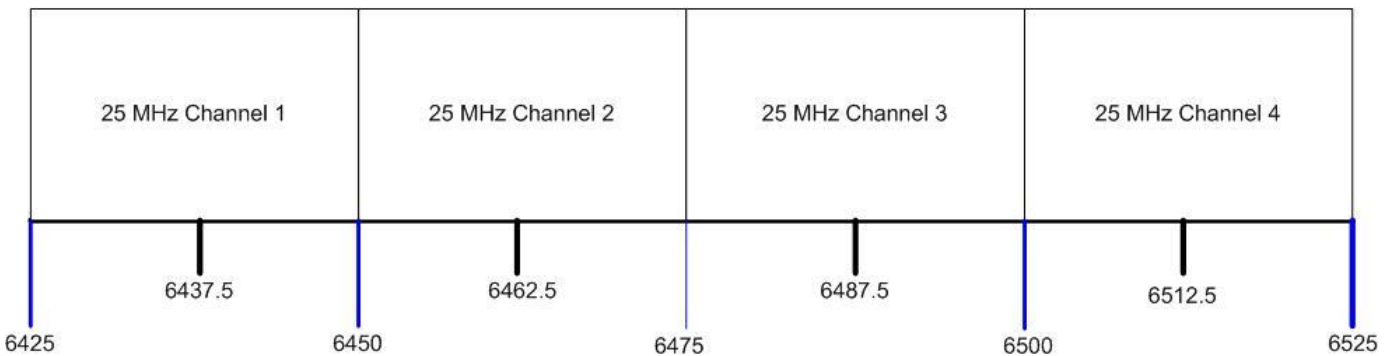
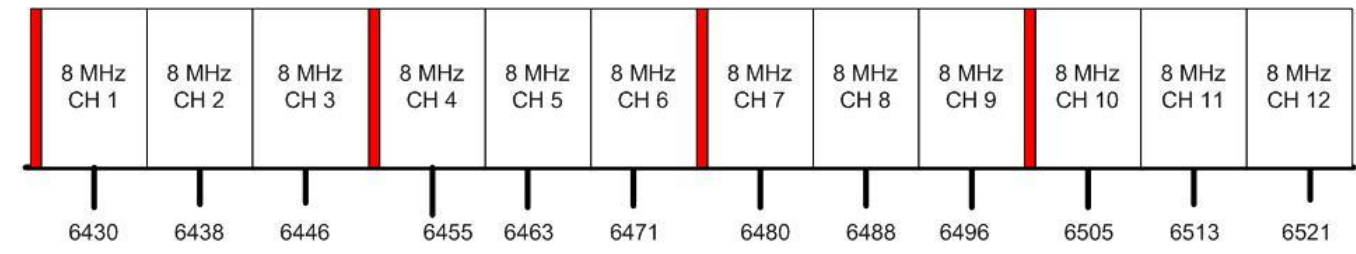
ARINC	Aeronautical Radio, Inc. Maintains standards for line-replaceable units in a aviation, defense, government, healthcare and other industries.
ASI	Asynchronous Serial Interface.
B-Frame	Contains difference information from the preceding and following I- or P-frame within a GOP
COFDM	Coded Orthogonal Frequency Division Multiplexing
DVB-T	Digital Video Broadcast - Terrestrial
ETSI	European Telecommunications Standards Institute
FEC	Forward Error Correction.
GOP	A group of successive pictures within a coded video stream. It may be made up of I frames only, I and B frames, or I, B, and P frames.
Guard Interval	An interval between transmissions to prevent data loss and reduce interference.
H.264	Synonymous with MPEG4, H.264 is an Advanced Video Coding standard providing high quality at lower bit rates than MPEG-2 / H.263.
HD	High Definition Television
I-Frame	A fixed image and which is independent of other picture types
P-Frame	Predictive frame; contains motion-compensated difference information from the preceding frame
PID	13-bit packet ID used to identify an elementary stream in an MPEG transport stream
QAM	Quadrature Amplitude Modulation (16QAM or 64 QAM)
QPSK	Quadrature Phase Shift Keying
RF	Radio Frequency
RS232	Recommended Standard 232 is a serial binary single-ended data and control standard for serial ports.
SD	Standard Definition refers digital video resolution not exceeding 480 lines in an interlaced format. The aspect ratio may be 4:3 or 16:9.
SDI	Serial Digital Interface, eg. SMPTE 259M standard

Appendix 1

The table and chart below summarizes the FCC channel plan for the 6.5 GHz band, as specified in part 101 of the commission's rules and regulations. Please note the restrictions on modulation bandwidth for the 8 MHz channels, as well as use of offsets within the 25 MHz channels. For US domestic applications, this is the default channel plan that is loaded into an HDX 1000 prior to shipment. This plan may be modified by the user to suit specific requirements. For application outside of the United States, consult with your local regulatory agencies.

FCC Channel Plan for 6.5 GHz Part 90 Frequencies					
Channel	Ctr Freq	- offset	+ offset	Ch Width	Pedestal
1	6430	None	None	8 MHz	6 & 7 MHz
2	6438	None	None	8 MHz	6 & 7 MHz
3	6446	None	None	8 MHz	6 & 7 MHz
4	6455	None	None	8 MHz	6 & 7 MHz
5	6463	None	None	8 MHz	6 & 7 MHz
6	6471	None	None	8 MHz	6 & 7 MHz
7	6480	None	None	8 MHz	6 & 7 MHz
8	6488	None	None	8 MHz	6 & 7 MHz
9	6496	None	None	8 MHz	6 & 7 MHz
10	6505	None	None	8 MHz	6 & 7 MHz
11	6513	None	None	8 MHz	6 & 7 MHz
12	6521	None	None	8 MHz	6 & 7 MHz
13*	6437.5	6431.25	6443.75	25 MHz	6, 7, 8, 9.4 MHz
14*	6462.5	6456.25	6468.75	25 MHz	6, 7, 8, 9.4 MHz
15*	6487.5	6481.25	6493.75	25 MHz	6, 7, 8, 9.4 MHz
16*	6512.5	6506.25	6518.75	25 MHz	6, 7, 8, 9.4 MHz

***NOTE: Pedestal limited to 6 MHz when offset is used**



FCC 6.5 GHz CHANNEL PLAN
Part 74 & 101 Rules